

Sub C1
CLAIMS

- 1/ A unitary composite connector for a liquid circuit, in particular for medical applications, the connector comprising:
- means constituting a tubular chamber between an upstream coupling and a downstream coupling situated at opposite ends of the chamber and fixed relative to each other, said upstream coupling constituting a passage;
- a hollow needle which is fixed in the chamber and which is suitable for causing the upstream coupling to communicate with the downstream coupling; and
- a plug suitable for being passed through by the needle, the plug being mounted in the passage of the downstream coupling so as to be capable of sliding between a downstream stable closure position where the plug closes said passage and where the needle does not pass through the plug, and an upstream position where said needle does pass through the plug and towards which the plug can be pushed by a member inserted in said passage from outside said connector, and means situated in the chamber resiliently urging the plug towards its stable closure position, the material of the plug being such that the plug retrieves its closure properties when the needle is not passing through it;
- wherein said passage of the downstream coupling has an outlet opening that is completely filled by the material of the plug when the plug is in its stable closure position, thereby preventing any dead volume at the end of the coupling and preventing bacteria entering at this location; and
- wherein the means resiliently urging the plug is a spring.
- 2/ A connector according to claim 1, wherein said plug is a force-fit in said *downstream Coupling means*.
- 3/ A connector according to claim 1, wherein the plug slides with lateral sealing in said *downstream Coupling means* and in said chamber.
- 35 4/ A connector according to claim 1, wherein the stable, closure position is defined by an abutment against which the plug bears.

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5 5/ A connector according to claim 1, wherein said spring is received in the chamber between an abutment which carries the needle and the plug, said spring urging the plug towards its downstream position where the plug is in abutment against a shoulder constituted by an inside annular rim ^{in said} of the chamber ~~downstream from said passage.~~

10 6/ A connector according to claim 1, wherein the plug has a concave end.

15 7/ A connector according to claim 1, wherein the plug has a convex end.

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15 8/ A connector according to claim 1, wherein said passage of the downstream coupling is conical in shape.

20 9/ A connector according to claim 8, wherein said plug has a conical shape complementary to that of said passage.

25 10/ A connector according to claim 1, wherein said needle includes a chamfered end.

11/ A connector according to claim 1, wherein the portion of the plug through which the needle is to pass includes a longitudinal perforation.

30 12/ A connector according to claim 1, wherein when the plug is in its closure position, the end of the needle is embedded in the material of the plug.

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35 13/ A connector according to claim 1, constituted by a combination of five pieces, namely: a case, an upstream coupling ^{means}, a needle, a closure plug, and a helical spring, which pieces are assembled together to constitute a unitary assembly.

14/ A connector according to claim 13, wherein the case delimits a tubular chamber between a downstream end which is

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 shaped to ~~constitute~~ *form* said passage and an upstream end which is shaped to receive the upstream coupling.

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157 A connector according to claim 1, wherein the upstream coupling is *means* a male coupling.

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167 A connector according to claim 1, wherein the chamber is divided into two compartments, respectively a downstream compartment and an upstream compartment, the needle is held in the chamber by a support and has two opposite chamfered ends respectively pointing towards the downstream coupling *means* and towards the upstream coupling *means*, and wherein two moving plugs close off communication respectively between the downstream compartment and the downstream coupling *means*, and between the upstream compartment and the upstream coupling *means*, each of said plugs being subjected to the action of a spring which bears against the central support and which pushes the plug towards a position where it is in abutment and the needle does not pass therethrough.

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177 A connector according to claim 1, wherein the upstream coupling *means* is secured to a tube.

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187 A connector according to claim 1, wherein the upstream coupling *means* is secured to an endpiece which constitutes a duct disposed transversely relative to the needle.

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197 A connector according to claim 1, wherein the needle passes right through the upstream coupling *means*.

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207 A connector according to claim 1, wherein the needle passes right through the upstream coupling *means* and receives an internal metal guide.

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217 A connector according to claim 1, wherein the upstream coupling *means* is secured to a tubular flexible duct having one communicating with the needle, and having its opposite end provided with a coupling.